ATTACHMENT 13

# GEOTECHNICAL ENGINEERING REPORT BROWN BEAR CAR WASH

## 55 Northwest Gilman Boulevard Issaquah, Washington

Prepared for: Car Wash Enterprises, Inc.

Project No. 080109 • November 12, 2019 FINAL

Aspect CONSULTING

earth + water

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Aspect Consulting, LLC


11/12/2019

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# 1 Introduction

This report presents the results of a geotechnical engineering study completed by Aspect Consulting, LLC (Aspect) on behalf of Car Wash Enterprises, Inc. (CWE) to fulfill the City of Issaquah requirement for a Soils Report for the Brown Bear Car Wash redevelopment (Project) located at 55 NW Gilman Blvd in Issaquah, Washington (Site; Figure 1). This report is intended to be used as an attachment for the City of Issaquah Land Use permit; it is for planning purposes only and not to be used as a stand-alone document.

This report summarizes explorations and geotechnical data collected to date, and presents our geotechnical engineering conclusions and recommendations based on the geotechnical data and current building concepts. The information and recommendations presented in this report are intended to assist the design team in the selection of foundation alternatives, construction methods, and to inform construction cost estimates for the Project.

## 1.1 Project Description

The Site has a history of use as a gasoline service station and car care facility. Environmental impacts are present in the Site soil and groundwater as a result of the historical operations. CWE has been conducting an environmental remediation in conjunction with plans to redevelop the Site as a car wash facility. Previous cleanup efforts included excavation of impacts to depths of 13 feet below ground surface and backfilling with clean fill, while future cleanup efforts will likely include the installation of an air sparging/soil vapor extraction (AS/SVE) system to treat deeper impacts. The current use of the site is a level gravel pad.

The proposed redevelopment of the Site includes the design and construction of a new Brown Bear Car Wash. The proposed 2,100 square foot car wash building is expected to consist of a single-story structure supported by shallow spread or strip footings bearing directly on the fill placed during the previous cleanup efforts. Foundation loads are expected to be typical of a building of this type and size. Small amounts of subsurface grading are expected to be required to install below-grade utilities and to manage Site drainage. Aspect's current understanding of the proposed development can be found on Figure 2.

# 2 Site Conditions

## 2.1 Surface

Current Site surface conditions consist a generally flat gravel pad, which has been backfilled after a recent remedial excavation. The western edge of the Site is bound by 1st Avenue NW. The eastern and northern edge of the Site is bound by an alley. The southern edge of the Site is bound by the Valvoline Instant Oil Change property.

## 2.2 Subsurface Conditions

The subsurface conditions at the Site were inferred from our review of geologic maps and explorations advanced at the Site by Aspect. The explorations by Aspect consisted of two hollow-stem auger borings. The location of these borings is shown on Figure 2. A detailed description of the exploration methods used, and our exploration logs are provided in Appendix A.

### *2.2.1 General Geology*

The geologic map of Issaquah maps the Site as being underlain by Holocene Fan deposits (Booth, 2006). These deposits generally consist of boulders, cobbles, sand, and diamict deposited in a lobate form where streams emerge from confining valleys, and the reduced gradients cause some of their sediment loads to be deposited. These units generally grade with Holocene alluvium deposits.

### *2.2.2 Stratigraphy*

Based on the completed subsurface explorations, we grouped the Site soils into two units: fill, and alluvium. Based on our understanding of the Site and our explorations, fill was placed to backfill the Site from a recent environmental remediation excavation a raise grades back to ground surface, as needed, throughout the Site.

The composition and distribution of these units are summarized below. For more detailed information regarding the composition and distribution of these units, please refer to the exploration logs provided in Appendix A.

#### Fill

Up to about 13 feet of fill was observed in our explorations ASB-01 and ASB-02. The fill typically consisted of medium dense to very dense, moist, brown and gray, silty gravel with sand (GM).

#### Alluvium

Alluvium was observed in both borings, AB-01 and AB-02 from depths of about 13 feet to the termination depths of the borings. The outwash generally consisted of medium dense to very dense, wet, brown and gray, gravel and sand with varying amount of silt

(GM and SM). A two-foot-thick layer of medium stiff silt with sand was also encountered from 13 to 15 feet below ground surface in ASB-01,

### 2.2.3 Groundwater

Groundwater levels were inferred from sample moisture at the time of drilling to be approximately 12 to 15 feet bgs. Groundwater levels at the Site are expected to fluctuate seasonally with changes in precipitation, Site usage, and other factors.

### 2.2.4 Critical/Geologically Hazardous Areas

Typical critical and geologically hazardous areas present in the Puget Sound area include landslide, erosion, liquefaction, wetland, and fault ground rupture critical/hazard areas. Based on the Site location, topography, surface conditions, and subsurface conditions, we conclude that of these critical/geologically hazardous areas, only liquefaction is relevant to the Site. The Washington Geologic Information Portal (DNR, 2019) indicates that of these hazard areas, the Site has a moderate to high susceptibility to liquification. The liquefaction susceptibility is further described in Section 3.2.

The Site is located in a seismically active region and subject to strong ground shaking during earthquakes. Accordingly, new structures should be designed to account for ground shaking in accordance with the current applicable building codes.

# 3 Seismic Hazard Evaluation

The Site is located within a region of active tectonic forces associated with the interaction of the offshore Juan de Fuca Plate, the Pacific Plate, and the onshore North American Plate. Seismic hazards include strong ground shaking from earthquakes associated with the Seattle Fault Zone (SFZ), the Cascadia Subduction Zone (CSZ), and deep intraslab earthquakes.

The SFZ is a zone of east-west thrust faults. The U.S. Geological Survey (USGS) estimates that the SFZ can produce earthquakes of magnitude 7.0 or greater. The last large earthquake on this fault system occurred about 1,100 years ago and resulted in up to 27 feet of uplift in parts of West Seattle.

The CSZ lies along the boundary of the converging oceanic plates (Juan de Fuca and Pacific Plates) and continental plate (North American Plate). CSZ earthquakes occur due to rupture between the subducting oceanic plate and the overlying continental plates. The CSZ can produce earthquakes up to magnitude 9.3, and the recurrence interval is thought to be on the order of about 500 years. The most recent subduction zone earthquake was estimated to occur about 300 years ago.

Deep intraslab earthquakes, which occur from tensional rupture of the sinking oceanic plate, are also associated with the CSZ. An example of this type of seismicity is the 2001 Nisqually earthquake. Deep intraslab earthquakes typically are magnitude 7.5 or less and occur approximately every 10 to 30 years.

## 3.1 Seismic Design Parameters

Seismic design for the Project will be for a "Maximum Considered Earthquake" (MCE) with an earthquake ground motion that has 2 percent probability of exceedance in 50 years, or a return period of approximately 2,500 years. The effects of Site-specific subsurface conditions on the earthquake ground motion at the ground surface are determined based on the "Site Class." The Site Class can be correlated to the average standard penetration resistance (N-value) or average shear wave velocity in the upper 100 feet of the soil profile. Based on the subsurface explorations completed at the Site, the soil profile below each building would classify as Site Class D (Stiff Soil Profile).

We understand the buildings will be permitted after the adoption of the 2018 International Building Code (IBC) and the American Society of Civil Engineers (ASCE) 7-16, *Minimum Design Loads for Buildings and Other Structures* (ASCE, 2017). The seismic design parameters, in accordance with the 2018 IBC and ASCE 7-16, and adjusted for Site Class D, are provided in Table 1.

**Table 1. Seismic Design Parameters**

| Ground Motion Parameter | Recommended Value |
|---|---|
| Site Class | D– "Stiff Soil" |
| Short Period Spectral Acceleration, $S_s$ (g) | 1.311 |
| 1-Second Period Spectral Acceleration, $S_1$ (g) | 0.453 |
| Site Coefficient ($F_a$) | 1.0 |
| Site Coefficient ($F_v$) | 1.847 |
| Design Short Period Spectral Acceleration, $S_{DS}$ (g) | 0.874 |
| Design 1-Second Period Spectral Acceleration, $S_{D1}$ (g) | 0.558 |
| Site-Adjusted Peak Ground Acceleration (g) | 0.616 |

**Note:** Parameters based on the latitude and longitude of the Site: 47.537973°N, 122.037268°W

## 3.2 Liquefaction Susceptibility

Liquefaction occurs when loose, saturated, and relatively cohesionless soil deposits temporarily lose strength and stiffness as a result of earthquake shaking. Potential effects of soil liquefaction include temporary loss of shallow-foundation bearing capacity, loss of deep-foundation axial and lateral capacity, vertical ground settlement, creekbank slope failure, and lateral ground movement towards creek banks or shoreline areas—any of which could result in structural damage. Primary factors controlling the triggering of liquefaction include intensity and duration of strong ground motion, characteristics of subsurface soils, *in situ* stress conditions, and the depth to groundwater.

Our explorations reveal that below the groundwater table, soils have sufficient relative density or plasticity/cohesiveness to render them nonsusceptible to liquefaction. Therefore, we conclude that liquefaction is not a design consideration at the Site.

## 3.3 Surficial Ground Rupture

Due to the suspected long recurrence interval, and the distance of the Site from the nearest known strand of the SFZ, and the great distance of the site from the CSZ, the potential for surficial ground rupture at the Site is considered low during the expected life of the structure.

# 4 Geotechnical Engineering Conclusions and Recommendations

## 4.1 Shallow Foundations on Fill

### *4.1.1 Allowable Bearing Pressure*

In our opinion, shallow spread footings are feasible for the new building. Shallow foundations bearing directly on fill soils may be designed for an allowable bearing pressure of 3 kips per square foot (ksf). This allowable bearing pressure assumes the foundations are embedded a minimum of 24 inches below the ground surface and a minimum square footing dimension of 3 feet or a strip footing width of 2.5 feet. The allowable bearing pressure may be increased by one-third for short-duration loading, such as wind and seismic loading.

### *4.1.2 Settlement*

We estimate footings bearing on the fill and designed in accordance with our recommendations will experience average total settlements of 1 inch or less. Differential settlements between adjacent column footings can be assumed to be about one-half of the total settlement. Differential settlement along continuous strip footings can be assumed to be approximately 0.5 inches per 25 feet of footing length. Total and differential settlement will occur rapidly as building loads are applied.

### *4.1.3 Lateral Resistance*

To resist lateral loading, we recommend using an allowable passive equivalent fluid density of 300 pounds per cubic foot and an allowable base friction coefficient of 0.33 for foundations embedded in the fill. These allowable values include a factor of safety of 1.5.

## 4.2 Slabs-on-Grade

Concrete slabs-on-grade for the car wash building should be designed in accordance with the American Concrete Institute (ACI) Committee 360 Guide to Design of Slabs-on-Ground (ACI, 2010). We recommend the slab be underlain with 6 inches of free-draining, crushed rock or well-graded sand and gravel to provide a uniform support. The crushed rock material should have a maximum particle size of 3/4 inches, with no more than 80 percent passing the No. 4 sieve and less than 5 percent fines (material passing the U.S. Standard No. 200 sieve).

For slabs that are designed as beam-on-elastic foundation, a modulus of subgrade reaction of 125 pounds per cubic inch (pci) may be assumed for design.

## 4.3 Construction Dewatering

We do not expect the excavations for the shallow foundations to encounter groundwater. If small amounts of groundwater are encountered during construction, we expect it can be managed using sumps and pumps at the discretion of the contractor.

## 4.4 Flexible Asphalt and Exterior Concrete Pavements

We anticipate new access driveway areas and passenger vehicle parking areas will be paved with flexible hot mix asphalt (HMA). We recommended the pavement section consist of 3 inches of HMA over 6 inches of crushed surfacing base and top course. The areas proposed to be paved with HMA can be found on Figure 2.

Rigid (concrete) pavement sections will provide greater resistance to rutting over time and improved reliability and serviceability when compared to HMA. In areas where rigid pavement is required, we recommend the concrete be at least 6 inches thick. The rigid pavements should be underlain by at least 6 inches of compacted crushed surfacing top and base course. The concrete should have a minimum 28-day compressive strength of 4,000 pounds per square inch (psi). To control concrete cracking due to temperature fluctuations and natural shrinkage, control joints should be placed every 15 to feet in both directions. The areas proposed to be paved with ridged pavement can be found on Figure 2.

We recommend Crushed Surfacing Base Course (CSBC) for the pavement base course, and Crushed Surfacing Top Course (CSTC) may be used over the CSBC for the upper 2 to 3 inches of the base course section. CSBC and CSTC, as specified in Section 9-03.9(3) of the *Standard Specifications* (WSDOT, 2019), should be used as top and base course for pavements.

## 4.5 Stormwater Infiltration

The City of Issaquah utilizes the Washington State Department of Ecology Water Quality Program *Stormwater Management Manual for Western Washington* (SWMMWW; Ecology, 2014). The SWMMWW states that utilizing infiltrating BMPs is infeasible for properties within 100 feet of an area known to have deep soil contamination. Due to the presence of environmentally impacted soil and groundwater beneath the Site, we consider shallow stormwater infiltration to be inadvisable. We recommend stormwater management be accomplished utilizing storm drainpipes that discharge into an appropriate system which will not infiltrate into the groundwater.

# 5 Earthwork Considerations and Recommendations

Excavation for the Project will occur mostly in dense sand and gravel fill. We anticipate excavation can take place with standard excavation equipment, such as tracked excavators.

## 5.1 Temporary Excavation Slopes

Temporary excavation slopes will be required for installation of spread footings and utilities. Temporary excavation and slopes should not exceed the limits specified in the local, state, and federal regulations. The stability of temporary excavations and slopes shall be the responsibility of the contractor. The fill deposits are classified as Type C soil in accordance with the Washington Administrative Code (WAC) 296-155 Part N (WAC, 2016). Temporary excavation slopes in Type C soils are anticipated to stand as steep as 1.5H:1V (Horizontal:Vertical). If unexpected seepage is encountered, the temporary excavation slopes may be required to be flattened to remain stable.

We also recommend the following:

- Surface water should be diverted away from slopes.
- Protect slopes using plastic sheet, flash coating, or tarps to control erosion and stability, as necessary.
- Limit the duration that excavations or slopes are open to the shortest time possible.
- Traffic, equipment, and material stockpiles should not be allowed near the top of excavations or slopes.
- The conditions of the excavations and slopes should be periodically observed by a competent person, who is a representative of the contractor, to evaluate safety and stability.

## 5.2 Subgrade Preparation

### *5.2.1 Shallow Foundations*

Foundation subgrades should be firm and unyielding and clear of all construction debris, loose or disturbed soil, and standing water prior to foundation construction. Soft or disturbed foundation subgrade areas, such as organic material, should be removed and replaced with structural fill. If organic material is encountered, it should be overexcavated until the competent fill is exposed and replaced with structural fill to reach the desired grade. Foundation preparation should be observed by Aspect prior to placing steel and pouring concrete to verify they have been prepared in conformance with our recommendations.

### 5.2.2 Slabs-on-Grade and Pavements

Slab-on-grade subgrade preparation should be observed and evaluated by a representative of Aspect prior to placement of the concrete or pavement section. All subgrade should be firm and unyielding under the proof-rolling load of heavy rubber-tired equipment where accessible and should be clear of any loose or disturbed soil or standing water. Disturbed or soft subgrade areas identified during evaluation should be removed and replaced with structural fill.

### 5.2.3 Pavement

The near-surface fill will provide suitable support for new pavement sections provided that any zones of concentrated organics and deleterious debris are removed from the pavement subgrade. All pavement subgrades should be carefully prepared. Prior to placing base course and pavement, all standard pavement subgrades should be proof-rolled with a fully loaded 10-cubic-yard dump truck or equivalent. An Aspect geotechnical engineer or engineering geologist should observe and evaluate the proof rolling operation. Any soft areas detected by the proof-rolling or other methods should be compacted in place or overexcavated to firm ground and backfilled with compacted structural fill to the design subgrade elevation. To provide for quality construction practices and materials, we recommend all pavement work and mix-design considerations conform to WSDOT standards.

The recommended pavement section is not intended to support extensive construction traffic, such as dump trucks and concrete Redi-mix trucks. Pavements subject to heavy construction traffic may be damaged and require repair.

Drainage is an essential aspect of pavement performance. We recommend providing all paved areas with positive drainage to remove surface water and water within the base course. This will be particularly important in cut sections or at low points within the paved areas, such as at catch basins.

## 5.3 Structural Fill

Soils placed beneath or around foundations, walls, utilities, slabs-on-grade, or below pavements should be considered structural fill. For these fill areas, we provide the following recommendations:

- Site-derived fill soils are suitable for reuse as structural fill but may be difficult to compact during wet weather. Additional fill can be imported per the recommendations below. Organic material or any soils with deleterious matter cannot be reused as structural fill.
- Structural fill to be used below foundations (for removal and replacement scenarios) can consist of appropriate on-Site material or crushed rock meeting the requirements for WSDOT Standard Specification Crushed Surfacing 9-03.9(3) (WSDOT, 2018).
- Structural fill should only be placed on a relatively firm and unyielding subgrade. The exposed subgrade soils should be compacted (in place) to a dense and unyielding condition prior to placement of structural fill.

- Structural fill should be compacted to a relatively firm and unyielding condition to a minimum density of 95 percent of the maximum dry density as determined by ASTM International (ASTM) D1557 (ASTM, 2018).
- Structural fill should be placed in lifts with a loose thickness no greater than 12 inches when using relatively large compaction equipment, such as a vibrating plate attached to an excavator (hoe pack) or drum roller. If small, hand-operated compaction equipment is used to compact structural fill, lifts should not exceed 6 inches in loose thickness.
- Moisture content of the structural fill should be controlled to within 2 to 3 percent of the optimum moisture. Optimum moisture is the moisture content corresponding to the maximum modified proctor dry density.
- Fill placed in softscape, general grading, landscape, or common areas that are not beneath or around structures, utilities, slabs-on-grade, or below paved areas that can accommodate some settlement should be compacted to a relatively firm and unyielding condition.

## 5.4 Utility Bedding and Backfill

General recommendations for bedding of utilities and backfill of utility trenches include:

- Materials to be used for utility bedding should consist of appropriate onsite material, meet the requirements WSDOT Standard Specification 9-03.9(3), or be as specified in the Standard Specification section applicable to the type of pipe being installed.
- Prior to installation of the pipe, the bedding material should be shaped to fit the lower portion of the pipe exterior with reasonable closeness to provide continuous support along the pipe.
- Bedding placed around the pipe should be placed in layers and tamped around the pipe to obtain complete contact. Pipe bedding material should be used as trench backfill to at least 6 inches above the crown of the pipe, for the full width of the trench. In areas where a trench box is used, the bedding material should be placed before the trench box is advanced.
- Trench backfill should meet the requirements for Structural Fill as described in Section 5.3 of this report. During placement of the initial lifts, the trench backfill material should not be bulldozed into the trench or dropped directly on the pipe. Furthermore, heavy vibratory equipment should not be permitted to operate over the pipe until at least 2 feet of backfill has been placed.

## 5.5 Temporary Erosion and Sedimentation Control

Temporary erosion-control measures should be implemented to prevent the migration of soil, dust, and turbid water off-Site or into stormwater systems. Such measures should include silt fences and straw wattles at the Site boundary, silt socks in nearby catch basins, wetting exposed soil during dry periods, and quarry spalls and wheel wash stations at truck and equipment exits.

## 5.6 Wet Weather Construction

Earthwork is typically most economical when performed under dry weather conditions. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions, we provide the following recommendations:

- Earthwork should be performed in small areas to minimize exposure to wet weather. The size and type of construction equipment used may have to be limited to prevent soil disturbance.
- Excavations for foundations, floor slabs, and pavements should be covered or protected (with concrete or WSDOT Standard Specification 9-03.9(3)) following approval of the subgrade by Aspect and should not be left open and exposed.
- Material used as structural fill should consist of clean, granular soil containing less than 7 percent fines.
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller (or equivalent) and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials.
- Excavation and placement of fill should be observed by Aspect to verify that all unsuitable materials are removed, and suitable compaction is achieved.
- Local best management practices (BMPs) for erosion protection should be strictly followed.

# 6 Additional Design and Construction Monitoring

At the time of this report, concept Site plans, Site grading, structural plans, and construction methods have not been developed or finalized, and the recommendations presented herein are based on preliminary project information. If project developments result in changes to the assumptions made herein, we should be contacted to determine if our recommendations should be revised. We recommend that we have an opportunity to review and provide input on Site development plans as they are advanced to ensure that the recommendations of this report are appropriately incorporated into the Site design.

We are available to provide geotechnical engineering and monitoring services during construction. The integrity of the foundation depends on proper site preparation and construction procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent.

# 7 References

American Concrete Institute (ACI) Committee 360, 2010, Guide to Design of Slabs-on-Ground.

American Society of Civil Engineers (ASCE), 2017, 7-16, Minimum Design Loads for Buildings and Other Structures.

ASTM International (ASTM), 2018, 2018 Annual Book of ASTM Standards, West Conshohocken, Pennsylvania.

Goldsmith Land Development Services (Goldsmith), 2017, ATLA/NSPS Land Title Survey for Lake Union Partners, Sheet 1 of 2 and 2 of 2, August 24, 2017.

Washington State Department of Ecology Water Quality Program (Ecology), 2014, 2014 Stormwater Management Manual for Western Washington.

Washington State Department of Natural Resources Division of Geology and Earth Resources (DNR), 2019, Washington Interactive Geologic Map, 2019, online at: https://fortress.wa.gov/ndr/protectiongis/geology/?Theme=wigm.

Washington State Department of Transportation (WSDOT), 2019, Standard Specifications for Road, Bridge and Municipal Construction, Document M 41-10.

Washington State Legislature, 2016, Washington Administrative Code (WAC), May 20, 2016.

# 8 Limitations

Work for this project was performed for Car Wash Enterprises, Inc. (Client), and this report was prepared consistent with recognized standards of professionals in the same locality and involving similar conditions, at the time the work was performed. No other warranty, expressed or implied, is made by Aspect Consulting, LLC (Aspect).

Recommendations presented herein are based on our interpretation of site conditions, geotechnical engineering calculations, and judgment in accordance with our mutually agreed-upon scope of work. Our recommendations are unique and specific to the project, site, and Client. Application of this report for any purpose other than the project should be done only after consultation with Aspect.

Variations may exist between the soil and groundwater conditions reported and those actually underlying the site. The nature and extent of such soil variations may change over time and may not be evident before construction begins. If any soil conditions are encountered at the site that are different from those described in this report, Aspect should be notified immediately to review the applicability of our recommendations.

It is the Client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, and agents, are made aware of this report in its entirety. At the time of this report, design plans and construction methods have not been finalized, and the recommendations presented herein are based on preliminary project information. If project developments result in changes from the preliminary project information, Aspect should be contacted to determine if our recommendations contained in this report should be revised and/or expanded upon.

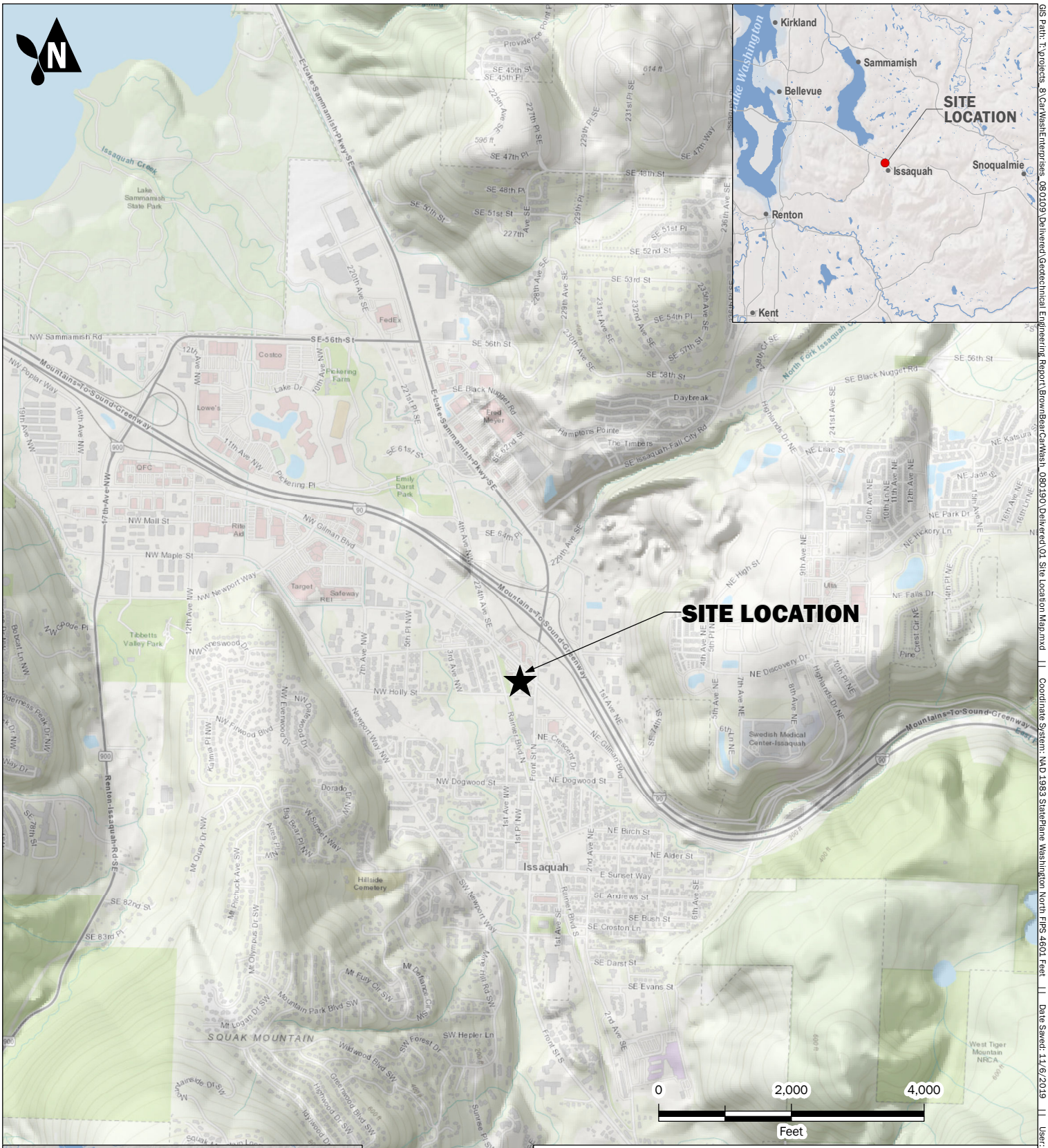
The scope of work does not include services related to construction safety precautions. Site safety is typically the responsibility of the contractor, and our recommendations are not intended to direct the contractor’s site safety methods, techniques, sequences, or procedures. The scope of our work also does not include the assessment of environmental characteristics, particularly those involving potentially hazardous substances in soil or groundwater.

All reports prepared by Aspect for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect. Aspect’s original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

**Please refer to Appendix B titled “Report Limitations and Guidelines for Use” for additional information governing the use of this report.**

We appreciate the opportunity to perform these services. If you have any questions, please call Rory Kilkenny PE, Geotechnical Engineer, at 541.256.0037.

# FIGURES

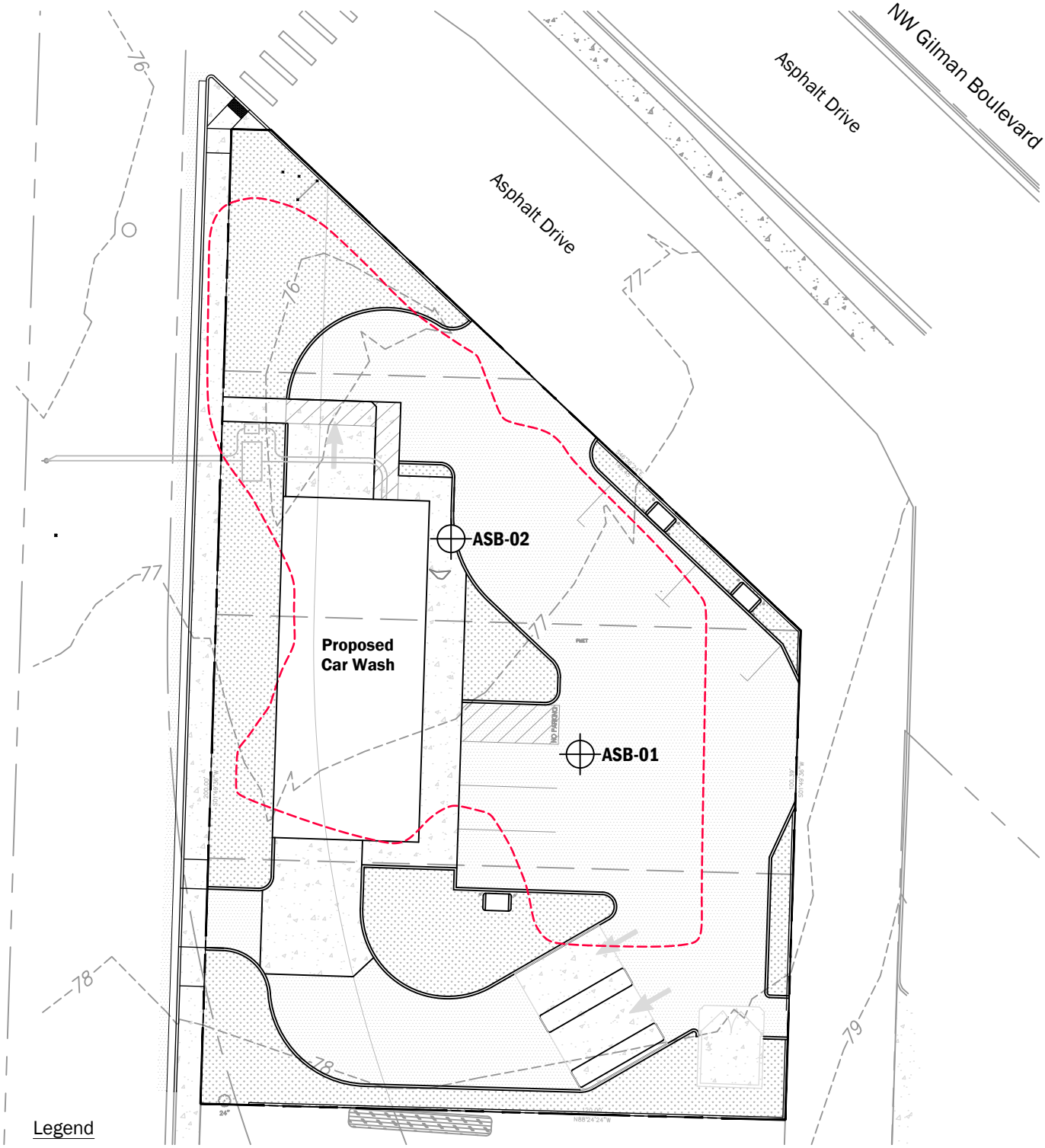



# Site Location Map

Geotechnical Engineering Report
Car Wash Enterprises
55 NW Gilman Boulevard
Issaquah, Washington

| | | | |
|---|---|---|---|
| Aspect CONSULTING | NOV-2019 | BY: RPK / WEG | FIGURE NO. 1 |
| | PROJECT NO. 080190 | REVISED BY: --- | |

GIS Path: T:\projects_8\CarWashEnterprises_080109\Delivered\Geotechnical Engineering Report\BrownBearCarWash_080190\Delivered\01 Site Location Map.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 11/6/2019 || User: bgrimm || Print Date: 11/6/2019




Legend

- Boring Location
- 2019 Remedial Excavation Boundary
- 78 Existing Contours
- Rigid Pavement
- Hot Mix Asphalt Pavement
- Landscape Area

0 30 60 Feet

Notes:
1. Current site conditions consist of gravel pad; proposed site conditions shown.

Source: Base map provided by Barghausen Consulting Engineers, Inc., dated November 5, 2019. Vertical datum NAVD 88.

# Geotechnical Exploration Plan

Car Wash Enterprises
55 NW Gilman Boulevard
Issaquah, Washington

| | | | |
|---|---|---|---|
| Aspect Consulting | Nov-2019 | BY: RK/CMV | FIGURE NO. 2 |
| | PROJECT NO. 080109 | REVISED BY: - | |

# APPENDIX A

# Subsurface Explorations

# A.1 Field Exploration Program

## A.1.1 Hollow-Stem Auger Borings

On October 18, 2019, Aspect Consulting, LLC (Aspect) completed two machine-drilled borings (designated ASB-01 and ASB-02) at the Site. The machine-drilled borings were advanced with hollow-stem auger drilling methods using a CME 75 truck-mounted drill rig operated by Cascade Drilling under subcontract to Aspect.

In the machine-drilled borings, disturbed soil samples were obtained at 2.5- and 5-foot intervals by driving a 2-inch split-barrel sampler (SPT sampler) 18 inches into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows required to drive the sampler 18 inches is recorded in three 6-inch intervals. The number of blows required to drive the sampler the last two intervals is known as the blow count. The blow count provides a measure of relative density or consistency of granular and cohesive soils, respectively.

An Aspect geotechnical engineer was present throughout the exploration program to observe the drilling procedures, assist in sampling, and to prepare descriptive logs of the explorations. Soils were identified in general accordance with ASTM International (ASTM) D2488, *Standard Practice for Description and Identification of Soils* (*Visual-Manual Procedure)* (ASTM, 2018). The summary exploration logs represent our interpretation of the contents of the field logs. The stratigraphic contacts shown on the individual summary logs represent the approximate boundaries between soil types; actual transitions may be more gradual. The subsurface conditions depicted are only for the specific date and locations reported; therefore, are not necessarily representative of other locations and times.

Upon completion, the machine-drilled borings were backfilled with 3/8-inch bentonite chips in accordance with requirements of the Washington State Department of Ecology.

| | | | | |
|---|---|---|---|---|
| Coarse-Grained Soils - More than 50%[1] Retained on No. 200 Sieve | Gravels - More than 50%[1] of Coarse Fraction Retained on No. 4 Sieve | ≤5% Fines | GW | Well-graded GRAVEL<br>Well-graded GRAVEL WITH SAND |
| | | | GP | Poorly-graded GRAVEL<br>Poorly-graded GRAVEL WITH SAND |
| | | ≥15% Fines | GM | SILTY GRAVEL<br>SILTY GRAVEL WITH SAND |
| | | | GC | CLAYEY GRAVEL<br>CLAYEY GRAVEL WITH SAND |
| | Sands - 50%[1] or More of Coarse Fraction Passes No. 4 Sieve | ≤5% Fines | SW | Well-graded SAND<br>Well-graded SAND WITH GRAVEL |
| | | | SP | Poorly-graded SAND<br>Poorly-graded SAND WITH GRAVEL |
| | | ≥15% Fines | SM | SILTY SAND<br>SILTY SAND WITH GRAVEL |
| | | | SC | CLAYEY SAND<br>CLAYEY SAND WITH GRAVEL |
| Fine-Grained Soils - 50%[1] or More Passes No. 200 Sieve | Silts and Clays Liquid Limit Less than 50% | | ML | SILT<br>SANDY or GRAVELLY SILT<br>SILT WITH SAND<br>SILT WITH GRAVEL |
| | | | CL | LEAN CLAY<br>SANDY or GRAVELLY LEAN CLAY<br>LEAN CLAY WITH SAND<br>LEAN CLAY WITH GRAVEL |
| | | | OL | ORGANIC SILT<br>SANDY or GRAVELLY ORGANIC SILT<br>ORGANIC SILT WITH SAND<br>ORGANIC SILT WITH GRAVEL |
| | Silts and Clays Liquid Limit 50% or More | | MH | ELASTIC SILT<br>SANDY or GRAVELLY ELASTIC SILT<br>ELASTIC SILT WITH SAND<br>ELASTIC SILT WITH GRAVEL |
| | | | CH | FAT CLAY<br>SANDY or GRAVELLY FAT CLAY<br>FAT CLAY WITH SAND<br>FAT CLAY WITH GRAVEL |
| | | | OH | ORGANIC CLAY<br>SANDY or GRAVELLY ORGANIC CLAY<br>ORGANIC CLAY WITH SAND<br>ORGANIC CLAY WITH GRAVEL |
| Highly Organic Soils | | | PT | PEAT and other mostly organic soils |

"WITH SILT" or "WITH CLAY" means 5 to 15% silt and clay, denoted by a "-" in the group name; e.g., SP-SM • "SILTY" or "CLAYEY" means >15% silt and clay • "WITH SAND" or "WITH GRAVEL" means 15 to 30% sand and gravel. • "SANDY" or "GRAVELLY" means >30% sand and gravel. • "Well-graded" means approximately equal amounts of fine to coarse grain sizes • "Poorly graded" means unequal amounts of grain sizes • Group names separated by "/" means soil contains layers of the two soil types; e.g., SM/ML.

Soils were described and identified in the field in general accordance with the methods described in ASTM D2488. Where indicated in the log, soils were classified using ASTM D2487 or other laboratory tests as appropriate. Refer to the report accompanying these exploration logs for details.

1. Estimated or measured percentage by dry weight
2. (SPT) Standard Penetration Test (ASTM D1586)
3. Determined by SPT, DCPT (ASTM STP399) or other field methods. See report text for details.

## GEOTECHNICAL LAB TESTS

| | | |
|---|---|---|
| MC | = | Natural Moisture Content |
| GS | = | Grain Size Distribution |
| FC | = | Fines Content (% < 0.075 mm) |
| GH | = | Hydrometer Test |
| AL | = | Atterberg Limits |
| C | = | Consolidation Test |
| Str | = | Strength Test |
| OC | = | Organic Content (% Loss by Ignition) |
| Comp | = | Proctor Test |
| K | = | Hydraulic Conductivity Test |
| SG | = | Specific Gravity Test |

## CHEMICAL LAB TESTS

***Organic Chemicals***

| | | |
|---|---|---|
| BTEX | = | Benzene, Toluene, Ethylbenzene, Xylenes |
| TPH-Dx | = | Diesel and Oil-Range Petroleum Hydrocarbons |
| TPH-G | = | Gasoline-Range Petroleum Hydrocarbons |
| VOCs | = | Volatile Organic Compounds |
| SVOCs | = | Semi-Volatile Organic Compounds |
| PAHs | = | Polycyclic Aromatic Hydrocarbon Compounds |
| PCBs | = | Polychlorinated Biphenyls |

***Metals***

| | | |
|---|---|---|
| RCRA8 | = | As, Ba, Cd, Cr, Pb, Hg, Se, Ag, (d = dissolved, t = total) |
| MTCA5 | = | As, Cd, Cr, Hg, Pb (d = dissolved, t = total) |
| PP-13 | = | Ag, As, Be, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn (d=dissolved, t=total) |

## FIELD TESTS

| | | |
|---|---|---|
| PID | = | Photoionization Detector |
| Sheen | = | Oil Sheen Test |
| SPT[2] | = | Standard Penetration Test |
| NSPT | = | Non-Standard Penetration Test |
| DCPT | = | Dynamic Cone Penetration Test |

## COMPONENT DEFINITIONS

| *Descriptive Term* | | *Size Range and Sieve Number* |
|---|---|---|
| Boulders | = | Larger than 12 inches |
| Cobbles | = | 3 inches to 12 inches |
| Coarse Gravel | = | 3 inches to 3/4 inches |
| Fine Gravel | = | 3/4 inches to No. 4 (4.75 mm) |
| Coarse Sand | = | No. 4 (4.75 mm) to No. 10 (2.00 mm) |
| Medium Sand | = | No. 10 (2.00 mm) to No. 40 (0.425 mm) |
| Fine Sand | = | No. 40 (0.425 mm) to No. 200 (0.075 mm) |
| Silt and Clay | = | Smaller than No. 200 (0.075 mm) |

## ESTIMATED[1] PERCENTAGE

| *% by Weight* | | *Modifier* | *% by Weight* | | *Modifier* |
|---|---|---|---|---|---|
| <1 | = | Subtrace | 15 to 25 | = | Little |
| 1 to <5 | = | Trace | 30 to 45 | = | Some |
| 5 to 10 | = | Few | >50 | = | Mostly |

## MOISTURE CONTENT

| | | |
|---|---|---|
| Dry | = | Absence of moisture, dusty, dry to the touch |
| Slightly Moist | = | Perceptible moisture |
| Moist | = | Damp but no visible water |
| Very Moist | = | Water visible but not free draining |
| Wet | = | Visible free water, usually from below water table |

## RELATIVE DENSITY

***Non-Cohesive or Coarse-Grained Soils***

| *Density*[3] | | *SPT*[2] *Blows/Foot* | *Penetration with 1/2" Diameter Rod* |
|---|---|---|---|
| Very Loose | = | 0 to 4 | ≥ 2' |
| Loose | = | 5 to 10 | 1' to 2' |
| Medium Dense | = | 11 to 30 | 3" to 1' |
| Dense | = | 31 to 50 | 1" to 3" |
| Very Dense | = | > 50 | < 1" |

## CONSISTENCY

***Cohesive or Fine-Grained Soils***

| *Consistency*[3] | | *SPT*[2] *Blows/Foot* | *Manual Test* |
|---|---|---|---|
| Very Soft | = | 0 to 1 | Penetrated >1" easily by thumb. Extrudes between thumb & fingers. |
| Soft | = | 2 to 4 | Penetrated 1/4" to 1" easily by thumb. Easily molded. |
| Medium Stiff | = | 5 to 8 | Penetrated >1/4" with effort by thumb. Molded with strong pressure. |
| Stiff | = | 9 to 15 | Indented ~1/4" with effort by thumb. |
| Very Stiff | = | 16 to 30 | Indented easily by thumbnail. |
| Hard | = | > 30 | Indented with difficulty by thumbnail. |

## GEOLOGIC CONTACTS

Observed and Distinct — Observed and Gradual — Inferred

Aspect CONSULTING

# Exploration Log Key

| Aspect CONSULTING | Brown Bear - Issaquah - 080109 | | Geotechnical Exploration Log | |
|---|---|---|---|---|
| | *Project Address & Site Specific Location*<br>55 NW Gilman Blvd Issaquah, WA 98027, W of Chevron Station, SE of ASB-02 | | *Coordinates (Lat,Lon WGS84)*<br>47.53796, -122.03722 (est) | *Exploration Number*<br>**ASB-01** |
| *Contractor*<br>Cascade | *Equipment*<br>CME 75 truck rig | *Sampling Method*<br>Autohammer; 140 lb hammer; 30" drop | *Ground Surface (GS) Elev. (NAVD88)*<br>77' (est) | |
| *Operator*<br>James | *Exploration Method(s)*<br>Hollow stem auger | *Work Start/Completion Dates*<br>10/18/2019 | *Top of Casing Elev. (NAVD88)*<br>NA | *Depth to Water (Below GS)*<br>15' (ATD) |

| Depth (feet) | Elev. (feet) | Exploration Completion and Notes | Sample Type/ID | Blows/foot ▲ Water Content (%)● 0 10 20 30 40 50 | Blows/6" | Tests | Material Type | Description | Depth (ft) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **Fill**<br>SILTY GRAVEL WITH SAND (GM); medium dense to dense, slightly moist to moist, brown-gray to brown; fine to coarse sand; fine to coarse gravel | |
| | 75 | Boring backfilled with bentonite chips. | | | 16<br>24<br>25 | Sheen =None<br>Odor =None<br>PID =0 | | | |
| 5 | | | | | 12<br>17<br>6 | Sheen =None<br>Odor =None<br>PID =0 | | | 5 |
| | 70 | | | | 9<br>10<br>12 | Sheen =None<br>Odor =None<br>PID =1.3 | | increased silt content, becomes brown. | |
| 10 | | | | | 3<br>6<br>6 | Sheen =Slight<br>Odor =Faint petroleum-like<br>PID =4.3 | | | 10 |
| | 65 | | | | 2<br>3<br>5 | ASB-01-12.5<br>Sheen =Moderate<br>Odor =Strong petroleum-like<br>PID =114.3 | | **Alluvium**<br>SANDY SILT (ML); medium stiff, very moist, gray; low to medium plasticity; fine to medium sand | |
| 15 | | ▽ 10/18/2019 | | | 4<br>3<br>7 | ASB-01-15.0<br>Sheen =HS<br>Odor =Faint petroleum-like<br>PID =34.5 | | SILTY GRAVEL WITH SAND (GM); dense, wet, brown-gray; fine to coarse sand; fine to coarse gravel | 15 |
| | 60 | | | | 12<br>19<br>7 | ASB-01-17.5<br>Sheen =Slight<br>Odor =None<br>PID =1.3 | | | |

**Legend**

Sample Type
- ◯ No Soil Sample Recovery
- ◪ Split Barrel 2" X 1.375" (SPT)

Plastic Limit ⊢⊣ Liquid Limit

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: IVT
Approved by: RPK

**Exploration Log ASB-01**
Sheet 1 of 2

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\080109 - BROWN BEAR ISSAQUAH.GPJ November 6, 2019

| Aspect CONSULTING | Brown Bear - Issaquah - 080109 | | Geotechnical Exploration Log | |
|---|---|---|---|---|
| | *Project Address & Site Specific Location*<br>55 NW Gilman Blvd Issaquah, WA 98027, W of Chevron Station, SE of ASB-02 | | *Coordinates (Lat,Lon WGS84)*<br>47.53796, -122.03722 (est) | *Exploration Number*<br>**ASB-01** |
| *Contractor*<br>Cascade | *Equipment*<br>CME 75 truck rig | *Sampling Method*<br>Autohammer; 140 lb hammer; 30" drop | *Ground Surface (GS) Elev. (NAVD88)*<br>77' (est) | |
| *Operator*<br>James | *Exploration Method(s)*<br>Hollow stem auger | *Work Start/Completion Dates*<br>10/18/2019 | *Top of Casing Elev. (NAVD88)*<br>NA | *Depth to Water (Below GS)*<br>15' (ATD) |

| Depth (feet) | Elev. (feet) | Exploration Completion and Notes | Sample Type/ID | Blows/foot ▲ Water Content (%) ● 0 10 20 30 40 50 | Blows/6" | Tests | Material Type | Description | Depth (ft) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 7<br>16<br>32 | ASB-01-20.0<br>Sheen =Slight<br>Odor =None<br>PID =2.8 | | SILTY GRAVEL WITH SAND (GM); dense, wet, brown-gray; fine to coarse sand; fine to coarse gravel (continued) | |
| | 55 | | | | 11<br>12<br>15 | ASB-01-22.5<br>Sheen =None<br>Odor =None<br>PID =< 1 ppm | | SILTY SAND (SM); medium dense, wet, brown-gray; fine to medium sand<br>SILTY GRAVEL WITH SAND (GM); medium dense, wet, brown-gray; fine to coarse sand; fine to coarse gravel | |
| 25 | | | | | 24<br>28<br>31 | ASB-01-25.0<br>Sheen =None<br>Odor =None<br>PID =1.0 | | SAND WITH SILT (SP-SM); very dense, wet, brown-gray; medium to coarse sand<br>SILTY GRAVEL WITH SAND (GM); very dense, wet, brown-gray; fine to coarse sand; fine to coarse gravel | 25 |
| | 50 | | | | 25<br>38<br>27 | Sheen<br>=Slight<br>Odor =None<br>PID =15.7 | | SAND WITH SILT (SW-SM); very dense, wet, brown-gray; fine to coarse sand | |
| 30 | | | | | 27<br>20<br>23 | Sheen<br>=Slight<br>Odor =None<br>PID =12.4 | | SILTY GRAVEL WITH SAND (GM); dense, wet, brown-gray; fine to coarse sand; fine to coarse gravel | 30 |
| | 45 | | | | | | | Bottom of exploration at 31.5 ft. bgs.<br><br>Note: Boring elevations not surveyed for this project. | |
| 35 | | | | | | | | | 35 |
| | 40 | | | | | | | | |

**Legend**

Sample Type
- ◯ No Soil Sample Recovery
- ◪ Split Barrel 2" X 1.375" (SPT)

Plastic Limit ⊢⟶⊣ Liquid Limit

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: IVT
Approved by: RPK

**Exploration Log ASB-01**
Sheet 2 of 2

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\080109 - BROWN BEAR ISSAQUAH.GPJ November 6, 2019

| Aspect CONSULTING | Brown Bear - Issaquah - 080109 | | Geotechnical Exploration Log | |
|---|---|---|---|---|
| | *Project Address & Site Specific Location*<br>55 NW Gilman Blvd Issaquah, WA 98027, W of Chevron Station, NW of ASB-01 | | *Coordinates (Lat,Lon WGS84)*<br>47.53808, -122.03733 (est) | *Exploration Number*<br>**ASB-02** |
| *Contractor*<br>Cascade | *Equipment*<br>CME 75 truck rig | *Sampling Method*<br>Autohammer; 140 lb hammer; 30" drop | *Ground Surface (GS) Elev. (NAVD88)*<br>77' (est) | |
| *Operator*<br>James | *Exploration Method(s)*<br>Hollow stem auger | *Work Start/Completion Dates*<br>10/18/2019 | *Top of Casing Elev. (NAVD88)*<br>NA | *Depth to Water (Below GS)*<br>12.5' (ATD) |

| Depth (feet) | Elev. (feet) | Exploration Completion and Notes | Sample Type/ID | Blows/foot ▲ Water Content (%)● 0 10 20 30 40 50 | Blows/6" | Tests | Material Type | Description | Depth (ft) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **Fill**<br>SILTY GRAVEL WITH SAND (GM); medium dense, very moist, brown; fine to coarse sand; fine gravel | |
| | 75 | Boring backfilled with bentonite chips. | | | 10<br>10<br>11 | Sheen =None<br>Odor =None<br>PID =1.4 | | | |
| 5 | | | | | 4<br>7<br>8 | Sheen =None<br>Odor =None<br>PID =<1 ppm | | | 5 |
| | 70 | | | | 8<br>12<br>16 | Sheen =None<br>Odor =None<br>PID =1.1 | | | |
| 10 | | | | | 15<br>17<br>19 | ASB-02-10.0<br>Sheen =Slight<br>Odor =None<br>PID =<1 ppm | | becomes dense | 10 |
| | 65 | ▽ 10/18/2019 | | | 11<br>28<br>25 | ASB-02-12.5<br>Sheen =Moderate<br>Odor =Faint petroleum-like<br>PID =9.9 | | **Alluvium**<br>SILTY GRAVEL WITH SAND (GM); very dense, wet, brown-gray; fine to coarse sand; fine to coarse gravel | |
| 15 | | | | | 7<br>12<br>11 | ASB-02-15.0<br>Sheen =Moderate<br>Odor =Petroleum-like<br>PID =53.6 | | | 15 |
| | 60 | | | | 13<br>50/6" | ASB-02-17.5<br>Sheen =Slight<br>Odor =None<br>PID =1.3 | | | |

**Legend**

Sample Type
- ◯ No Soil Sample Recovery
- ◪ Split Barrel 2" X 1.375" (SPT)

Plastic Limit ⊢—⊣ Liquid Limit

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: IVT
Approved by: RPK

**Exploration Log ASB-02**
Sheet 1 of 2

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\080109 - BROWN BEAR ISSAQUAH.GPJ November 6, 2019

| Aspect CONSULTING | Brown Bear - Issaquah - 080109 | | Geotechnical Exploration Log | |
|---|---|---|---|---|
| | *Project Address & Site Specific Location*<br>55 NW Gilman Blvd Issaquah, WA 98027, W of Chevron Station, NW of ASB-01 | | *Coordinates (Lat,Lon WGS84)*<br>47.53808, -122.03733 (est) | *Exploration Number*<br>**ASB-02** |
| *Contractor*<br>Cascade | *Equipment*<br>CME 75 truck rig | *Sampling Method*<br>Autohammer; 140 lb hammer; 30" drop | *Ground Surface (GS) Elev. (NAVD88)*<br>77' (est) | |
| *Operator*<br>James | *Exploration Method(s)*<br>Hollow stem auger | *Work Start/Completion Dates*<br>10/18/2019 | *Top of Casing Elev. (NAVD88)*<br>NA | *Depth to Water (Below GS)*<br>12.5' (ATD) |

| Depth (feet) | Elev. (feet) | Exploration Completion and Notes | Sample Type/ID | Blows/foot ▲ Water Content (%) ● 0 10 20 30 40 50 | Blows/6" | Tests | Material Type | Description | Depth (ft) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 50/6" | ASB-02-20.0<br>Sheen =Slight<br>Odor =None<br>PID =<1 ppm | | SAND WITH SILT (SP-SM); very dense, wet, brown-gray; fine to coarse sand | |
| | | | | | | | | SILTY GRAVEL WITH SAND (GM); very dense, wet, brown-gray; fine to coarse sand, fine to coarse gravel | |
| | 55 | | | | 5/6" | ASB-02-22.5<br>Sheen =Slight<br>Odor =None<br>PID =<1 ppm | | silt (ML) interbed (2" thick) | |
| 25 | | | | | 10<br>25<br>30 | ASB-02-25.0<br>Sheen =None<br>Odor =None<br>PID =1.4 | | SILTY SAND (SM); very dense, wet, brown-gray; slow dilatancy; fine to coarse sand | 25 |
| | 50 | | | | | | | fine to coarse gravel layer (3" thick) | |
| | | | | | 11<br>27<br>42 | Sheen =None<br>Odor =None<br>PID =2.7 | | SILTY SAND WITH GRAVEL (SM); very dense, very moist, brown-gray to light brown; fine to coarse sand; fine gravel | |
| 30 | | | | | 32<br>50/6" | Sheen =None<br>Odor =None<br>PID =1.2 | | increased silt content | 30 |
| | | | | | | | | Bottom of exploration at 31 ft. bgs.<br>Note: Boring elevations not surveyed for this project. | |
| | 45 | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 35 | | | | | | | | | 35 |
| | 40 | | | | | | | | |

**Legend**

Sample Type
- ◯ No Soil Sample Recovery
- ◪ Split Barrel 2" X 1.375" (SPT)

Plastic Limit ⊢⊣ Liquid Limit

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: IVT
Approved by: RPK

**Exploration Log ASB-02**
Sheet 2 of 2

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\080109 - BROWN BEAR ISSAQUAH.GPJ November 6, 2019

# APPENDIX B

# Report Limitations and Guidelines for Use

# REPORT LIMITATIONS AND GUIDELINES FOR USE

## This Report and Project-Specific Factors

Aspect Consulting, LLC (Aspect) considered a number of unique, project-specific factors when establishing the Scope of Work for this project and report. You should not rely on this report if it was:

- Not prepared for you
- Not prepared for the specific purpose identified in the Agreement
- Not prepared for the specific real property assessed
- Completed before important changes occurred concerning the subject property, project or governmental regulatory actions

## Geoscience Interpretations

The geoscience practices (geotechnical engineering, geology, and environmental science) require interpretation of spatial information that can make them less exact than other engineering and natural science disciplines. It is important to recognize this limitation in evaluating the content of the report. If you are unclear how these "Report Limitations and Use Guidelines" apply to your project or site, you should contact Aspect.

## Reliance Conditions for Third Parties

This report was prepared for the exclusive use of the Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against liability claims by third parties with whom there would otherwise be no contractual limitations. Within the limitations of scope, schedule, and budget, our services have been executed in accordance with our Agreement with the Client and recognized geoscience practices in the same locality and involving similar conditions at the time this report was prepared

## Property Conditions Change Over Time

This report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by events such as a change in property use or occupancy, or by natural events, such as floods, earthquakes, slope instability, or groundwater fluctuations. If any of the described events may have occurred following the issuance of the report, you should contact Aspect so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

## Discipline-Specific Reports Are Not Interchangeable

The equipment, techniques, and personnel used to perform a geotechnical or geologic study differ significantly from those used to perform an environmental study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually address any environmental findings, conclusions, or recommendations (e.g., about the likelihood of encountering underground storage tanks or regulated contaminants). Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding the subject property.

We appreciate the opportunity to perform these services. If you have any questions please contact the Aspect Project Manager for this project.